

**DuPont™ Suva®**  
refrigerants

# Retrofit Guidelines for DuPont™ Suva® HFC Refrigerants

Suva® 134a for R-12 Retrofit

Suva® 404A (HP62) and Suva® 507 for R-502 Retrofit

Suva® 404A (HP62) and Suva® 507 for R-22 Retrofit



# Retrofit Guidelines for DuPont™ Suva® HFC Refrigerants

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## Introduction

With the phaseout of CFCs and HCFCs, existing refrigeration and air-conditioning equipment operating with CFCs and HCFCs will ultimately need to be either replaced with new equipment or retrofitted with alternative refrigerants. Some service technicians and equipment owners have elected to retrofit to hydrofluorocarbon (HFC) refrigerants such as DuPont™ Suva® 134a, Suva® 404A (HP62), or Suva® 507.

Using these procedures, R-12, R-502, and R-22 equipment can be safely and efficiently retrofitted with HFC-based Suva® refrigerants, allowing the equipment to continue in service for the remainder of its useful life. These retrofit guidelines are intended for equipment containing positive displacement compressors.

### **R-12 Replacement Choices**

**Suva® 134a (R-134a)** is the long-term HFC replacement for R-12 in new equipment and for retrofitting some R-12 systems such as supermarket display cases, commercial refrigeration and air-conditioning equipment, appliances, and transport refrigeration equipment. In stationary equipment Suva® 134a is recommended for retrofit of equipment with evaporator temperatures above 20°F (−7°C) to ensure best performance. Suva® 134a may be used in existing equipment at lower evaporator temperatures, but it can exhibit reduced capacity compared with R-12 unless system modifications are made.

### **R-502 Replacement Choices**

- **Suva® 404A (HP62)** is widely recognized as the preferred HFC replacement for R-502 in new equipment and for retrofitting R-502 systems such as supermarket and food service, industrial freezing, and some transport refrigeration. Suva® 404A (HP62) offers the closest HFC match to R-502 performance and can be used over the full R-502 operating range. Suva® 404A (HP62) also provides lower compressor discharge temperatures than R-502, which can increase compressor reliability and life.
- **Suva® 507 (R-507)** is an HFC replacement option for R-502 in new equipment and for retrofitting R-502 systems. Suva® 507 can also be used over the full R-502 operating range, and provides lower compressor discharge temperatures than R-502, which can increase compressor reliability and life.

- **Suva® 407C (R-407C)** is also an HFC retrofit option for R-502 in certain equipment. Refer to ART-34 “Retrofit Guidelines for Suva® 407C” for details.

### **R-22 Replacement Choices**

**Suva® 404A (HP62)** and **Suva® 507 (R-507)** are HFC retrofit options for R-22 refrigeration equipment, especially for medium and low temperature applications. These products will provide similar cooling capacity at evaporator temperatures in the range of 30°F to 50°F (−1°C to 10°C). At evaporator temperatures below 30°F (−1°C), the cooling capacity is greater than R-22. At 0°F (−18°C) the capacity is about 6% higher; and at −40°F (−40°C) the capacity is about 30% higher.

At evaporator temperatures above 10°F (−12°C) there is an energy efficiency penalty of about 5 to 10%. At evaporator temperatures below 10°F (−12°C) Suva® 404A (HP62) and 507 have similar energy efficiency, increasing to about +20% at −40°F (−40°C).

**Suva® 404A (HP62)** and **507** will have higher discharge pressure than R-22, but lower compression ratios; and also lower discharge temperature.

- **Suva® 407C (R-407C)** should also be considered as a retrofit option for R-22 in medium temperature equipment. It will provide similar cooling capacity and energy efficiency at evaporator temperatures above 25°F (4°C). Refer to ART-34 “Retrofit Guidelines for Suva® 407C” for details

### **Using HFCs versus Service Refrigerants**

Refrigerants such as Suva® MP39, Suva® 409A, Suva® HP80 and Suva® 408A are often selected for retrofit instead of HFCs because these service refrigerants typically involve an easier and more cost-effective retrofit procedure while providing improved performance over the CFCs they replace. The compressor oil change procedures are typically less complicated with the service refrigerants, which results in lower retrofit costs. Refer to DuPont bulletin ART-36 “Retrofit Guidelines for Suva® Service Refrigerants” for full details.

## Important Safety Information

Like CFCs, Suva® refrigerants are safe when handled properly. However, any refrigerant can cause injury or even death when mishandled. Please review the following guidelines before using *any* refrigerant.

- **Do not work in high concentrations of refrigerant vapors.** Always maintain adequate ventilation in the work area. Do not breathe vapors. Do not breathe lubricant mists from leaking systems. Ventilate the area well after *any* leak before attempting to repair equipment.
- **Do not use handheld leak detectors to check for breathable air.** These detectors are not designed to determine if the air is safe to breathe. Use oxygen monitors to ensure adequate oxygen is available to sustain life.
- **Do not use flames or torches to search for leaks.** Do not use flames in high concentrations of refrigerant. Open flames release large quantities of acidic compounds in the presence of all refrigerants, and these compounds can be hazardous. Do not use torches as leak detectors. Old halide torches detect chlorine, which may not be present with new refrigerants. Use an electronic leak detector designed to find the refrigerants you are using.

If you detect a visible change in the size or color of a flame when using torches to repair equipment, **stop work immediately and leave the area.** Ventilate the work area well and stop any refrigerant leaks before resuming work. These flame effects may be an indication of very high refrigerant concentrations, and continuing to work without adequate ventilation may result in injury or death.

**Note:** Any refrigerant can be hazardous if used improperly. Hazards include liquid or vapor under pressure, and frostbite from the escaping liquid. Overexposure to high concentrations of vapor can cause asphyxiation and cardiac arrest. Please read all safety information before handling any refrigerant.

For more detailed information on the properties, uses, storage, and handling of Suva® refrigerants, see DuPont Technical Bulletin P-134a or P-HP, or other literature specific to these products. Refer to the appropriate Material Safety Data Sheet (MSDS) for more safety information about each refrigerant. DuPont Safety Bulletin AS-1 gives additional information for safe handling of refrigerants.

## Lubricant and Filter Drier Information

### Lubricants

Lubricant selection is based on many factors, including compressor wear characteristics, material compatibility, and lubricant/refrigerant miscibility that can affect oil return to the compressor. Before starting a retrofit, consult the compressor manufacturer to determine the correct lubricant for your compressor. Other information sources are DuPont Refrigerant Distributors, lubricant manufacturers, and system manufacturers.

Polyol ester (POE) lubricants must be used with Suva® 134a, Suva® 404A (HP62) or Suva® 507 refrigerants. These lubricants are available from DuPont Refrigerant Distributors. To provide optimum oil return, equipment using mineral oil or alkylbenzene must be flushed to remove at least 95% of these oils. See the retrofit procedures below for more information.

Special care should be taken when handling POE lubricants because of their tendency to absorb water. Minimize contact with air and store the lubricant in a sealed container.

### Filter Drier

Change the filter drier during the retrofit. This is a routine practice following system maintenance. There are two types of filter driers commonly used, solid core and packed bead.

Replace the drier with the same type you currently use. The drier label will show which refrigerants can be used with that drier. Check with your DuPont Refrigerant Distributor for the correct drier to use in your system.

## General Retrofit Information

### System Modifications

The compositions of these Suva® refrigerants have been selected to provide performance comparable with the refrigerants they are replacing in terms of both capacity and energy efficiency. As a result, minimal system modifications are anticipated with retrofitting. Suva® 404A (HP62) and Suva® 507 are near-azeotropes at most temperatures, therefore the vapor composition in the refrigerant cylinder is slightly different from the liquid composition. This small difference will not affect performance in direct expansion systems, but it could affect performance in systems with flooded evaporators.

You should consult the original equipment manufacturer for recommendations concerning the compatibility of elastomers and plastics used in their system and the new refrigerant. Although many system components used with CFCs are also compatible with Suva® refrigerants, there are exceptions that, if not replaced, can cause refrigerant leakage or system failure.

**Field experience has shown that some systems retrofitted directly from R-502 to Suva® 404A (HP62) or Suva® 507 can have increased leakage due to shrinkage of elastomers (o-rings, gaskets) following removal of the R-502. This same situation might exist in an R-22 retrofit. Replacement of these elastomers may add additional cost and time to the retrofit.**

Retrofits of R-12 or R-502 systems with other alternative refrigerants such as HCFC-22 may require more extensive modifications to the existing equipment, such as replacement of the compressor with multistage compressors or use of liquid injection. For some systems this additional cost may be large. Suva® refrigerants provide the service contractor and equipment owner with a cost-effective way to retrofit an existing system.

**Note:** Suva® refrigerants were not designed for use in conjunction with other refrigerants or additives that have not been clearly specified by DuPont or the equipment manufacturer. Mixing Suva® refrigerants with other refrigerants, may have an adverse effect on system performance. “Topping off” a different refrigerant with any Suva® refrigerant is not recommended.

### Refrigerant Recovery Information

Most recovery or recycle equipment used for R-12, R-502, or R-22 can be used for Suva® refrigerants. Use standard procedures to avoid cross-contamination when switching from one refrigerant to another. Consult the equipment manufacturer for specific recommendations.

In the United States, DuPont will take back for reclaim the Suva® refrigerants discussed in this bulletin.

### What to Expect Following a Retrofit

These tables show approximate system performance changes following a retrofit. These values are general guidelines for system behavior, and actual performance will vary with each system.

Suva® 134a is compared to R-12, Suva® 404A (HP62) and Suva® 507 are compared to R-502.

DuPont™ Suva® Refrig.	Disch. Press. psi (kPa)	Suct. Press. psi (kPa)	Disch. Temp. °F (°C)	Refrig. Cap'y. (%)
134a	+10 (69.8)	-2 (-13.8)	-10 (-5.6)	-10
404A(HP62)	+20 (+137.9)	Same	-10 (-5.6)	Same
507	+30 (+206.8)	Same	-15 (+8.3)	Same

Suva® 404A (HP62) is compared to R-22 (evap. temp. = 0°F [-18°C]). **Note:** Suva® 507 provides performance very similar to 404A (HP62).

DuPont™ Suva® Refrig.	Disch. Press. psi (kPa)	Suct. Press. psi (kPa)	Compression Ratio (%)	Disch. Temp. °F (°C)	Refrig. Cap'y. (%)
404A(HP62)	+45 (+310)	+10 (+69.8)	-5	-64 (-36)	+6

### How to read these tables

*Example:* R-12 to Suva® 134a retrofit. Discharge pressure with 134a will be in the range of 10 psig higher than R-12 (using discharge pressure column above).

### **Retrofit Summary for HFC Refrigerants**

Select the **Retrofit Checklist** from the Appendix for the refrigerant you are replacing.

1. Establish baseline performance with CFC/HCFC.
2. Drain mineral oil or alkylbenzene (MO/AB) from the system and measure the volume removed. Leave the CFC/HCFC refrigerant in the system.
3. Add POE lubricant; use the same volume as removed in Step 2. Start up system and operate for at least 24 hours, or more if system has complex piping.
4. Drain POE, and repeat steps 2 and 3 at least two more times. Continue flushing until MO/AB is less than 5% by weight or as recommended by compressor manufacturer.
5. Recover the CFC/HCFC charge into a proper recovery cylinder.
6. Replace the filter/drier.
7. Evacuate system and check for leaks.
8. Charge with Suva® refrigerant. Remove liquid only from charging cylinder for Suva® 404A (HP62) or Suva® 507. Typical charge is 75–90% by weight of CFC/HCFC charge.
9. Start up system, adjust charge size. Label system for the refrigerant and lubricant used.

***Retrofit Complete***

### **Retrofit of R-12 Systems to DuPont™ Suva® 134a**

The following detailed discussion is the recommended procedure for retrofitting R-12 systems to Suva® 134a.

1. **Establish baseline performance with CFC.** Collect system performance data while the R-12 is in the system. Check for correct refrigerant charge and operating conditions. The baseline data of temperatures and pressures at various points in the system (evaporator, condenser, compressor suction and discharge, superheat and subcool, etc.) at normal operating conditions will be useful when optimizing

operation of the system with the Suva® refrigerant. A **System Data Sheet** is included at the back of this document to record baseline data.

2. **Drain mineral oil or alkylbenzene from the system and measure the volume removed. Leave the CFC refrigerant in the system.** If mineral oil or alkylbenzene is the existing lubricant, it will have to be drained. This may require removing the compressor from the system, particularly with small hermetic compressors that have no oil drain port. In this case, the lubricant should be drained from the suction port on the compressor after the R-12 has been properly recovered. For an effective flush, it is important to remove at least 50% of the lubricant in all cases. Larger systems may require drainage from additional points in the system, particularly low spots around the evaporator. In systems with an oil separator, any lubricant present in the separator should also be drained.  
  
In all cases, measure the volume of lubricant removed from the system. Record this information on the Retrofit Checklist (see Appendix). Compare this volume with the compressor/system specifications to ensure that the majority of lubricant has been removed. Consult the compressor manufacturer for recommendations on allowable residual MO/AB in POE lubricant. If poor system performance is noted on start-up, an additional lubricant change may be required.
3. **Add POE lubricant; use the same volume as removed in Step 2. Start up system and operate for at least 24 hours, or more if system has complex piping.** Charge the compressor with the same volume of new lubricant as the amount you removed from the system in step 2. Use a lubricant viscosity and grade recommended by the compressor manufacturer for the Suva® refrigerant you are using; or use a similar viscosity to the oil you removed if compressor information is not available. A typical viscosity is 150 SUS or ISO 32 for many compressors.
4. **Drain POE, and repeat steps 2 and 3 at least two more times. Continue flushing until MO/AB is less than 5% by weight or as recommended by compressor manufacturer.** For an HFC refrigerant to operate properly in a retrofitted system, the residual MO/AB concentration must be very low. Repeatedly removing and replacing the POE will flush the old oil from the refrigeration system, providing that enough time is allowed with each change to circulate oil through the entire system.

5. **Recover the CFC charge into a proper recovery cylinder.** Use normal service practices. If the correct charge size is not known, weigh the amount of refrigerant recovered.
6. **Replace the filter/drier.** It is routine practice to replace the filter/drier following system maintenance. Replacement driers are available that are compatible with Suva® refrigerants. See page 2 of this manual for additional information on driers.
7. **Evacuate system and check for leaks.** To remove air or other noncondensables in the system, evacuate the system to near full vacuum (29.9 inHg vacuum [500 microns] or less than 10 kPa).
8. **Charge with Suva® refrigerant.** In general, the refrigeration system will require less weight of the Suva® 134a than of R-12. The optimum charge will vary depending on the system design and operating conditions. For most systems the best charge size will be 75–90% by weight of the original R-12 charge.

For best results:

- It is recommended that the system be initially charged with about 75% by weight of the original charge.
  - Add the initial charge of Suva® refrigerant to the high-pressure side of the system (compressor *not* running) until the system and cylinder pressures equalize. Then connect to the low-pressure side of the system, start the compressor, and load the remainder of the refrigerant slowly to the suction side of the system.
9. **Start up system, adjust charge size. Label system for the refrigerant and lubricant used.** Start the system and let conditions stabilize. If the system is undercharged, add Suva® 134a in small amounts until the system conditions reach the desired level. See the Pressure/Temperature Charts in this bulletin to compare pressures and temperatures.

Suva® refrigerants are more sensitive to charge size than CFCs. System performance will change quickly if the system is overcharged or undercharged. Sight glasses in the liquid line can be used in most cases as a guide, but system charge should also be determined by measuring system operating conditions (discharge and suction pressures, suction line temperature, compressor motor amps, superheat, etc.). **Attempting to charge until**

**the sight glass is clear may result in overcharging the refrigerant.** Please read “How to Determine Suction Pressure, Superheat and Subcool” on page 8.

## Retrofit of R-502 Systems to DuPont™ Suva® 404A (HP62) or DuPont™ Suva® 507

The following detailed discussion is the recommended procedure for retrofitting R-502 systems to Suva® 404A (HP62) or Suva® 507.

1. **Establish baseline performance with CFC.** Collect system performance data while the R-502 is in the system. Check for correct refrigerant charge and operating conditions. The baseline data of temperatures and pressures at various points in the system (evaporator, condenser, compressor suction and discharge, superheat and subcool, etc.) at normal operating conditions will be useful when optimizing operation of the system with the Suva® refrigerant. A **System Data Sheet** is included at the back of this document to record baseline data.
2. **Drain mineral oil or alkylbenzene from the system and measure the volume removed. Leave the CFC refrigerant in the system.** If mineral oil or alkylbenzene is the existing lubricant, it will have to be drained. This may require removing the compressor from the system, particularly with small hermetic compressors that have no oil drain port. In this case, the lubricant should be drained from the suction port on the compressor after the R-502 has been properly recovered. For an effective flush, it is important to remove at least 50% of the lubricant in all cases. Larger systems may require drainage from additional points in the system, particularly low spots around the evaporator. In systems with an oil separator, any lubricant present in the separator should also be drained.

In all cases, measure the volume of lubricant removed from the system. Record this information on the Retrofit Checklist (see Appendix). Compare this volume with the compressor/system specifications to ensure that the majority of lubricant has been removed. Consult the compressor manufacturer for recommendations on allowable residual MO/AB in POE lubricant. If poor system performance is noted on start-up, an additional lubricant change may be required.

3. **Add POE lubricant; use the same volume as removed in Step 2. Start up system and operate for at least 24 hours, or more if system has complex piping.** Charge the compressor with the same volume of new lubricant as the amount you removed from the system in step 2. Use a lubricant viscosity and grade recommended by the compressor manufacturer for the Suva® refrigerant you are using; or use a similar viscosity to the MO/AB you removed if compressor information is not available. A typical viscosity is 150 SUS or ISO 32 for many compressors.
4. **Drain POE, and repeat steps 2 and 3 at least two more times. Continue flushing until MO/AB is less than 5% by weight or as recommended by compressor manufacturer.** For an HFC refrigerant to operate properly in a retrofitted system, the residual MO/AB concentration must be very low. Repeatedly removing and replacing the POE will flush the old oil from the refrigeration system, providing that enough time is allowed with each change to circulate oil through the entire system.
5. **Recover the CFC charge into a proper recovery cylinder.** Use normal service practices. If the correct charge size is not known, weigh the amount of refrigerant recovered.
6. **Replace the filter/drier.** It is routine practice to replace the filter/drier following system maintenance. Replacement driers are available that are compatible with Suva® refrigerants. See page 2 of this manual for additional information on driers.
7. **Evacuate system and check for leaks.** To remove air or other noncondensables in the system, evacuate the system to near full vacuum (29.9 inHg vacuum [500 microns] or less than 10 kPa).
8. **Charge with Suva® refrigerant. Remove liquid only from charging cylinder.** *The proper cylinder position for liquid removal is indicated by arrows on the cylinder and cylinder box.* Once liquid is removed from the cylinder, the refrigerant can be charged to the system as liquid or vapor as desired. Use the manifold gauges or a throttling valve to flash the liquid to vapor if required.

In general, the refrigeration system will require less weight of the Suva® refrigerant than of R-502. The optimum charge will vary depending on the system design and operating conditions, but for most systems the best charge size will be 75–90% by weight of the original charge.

For best results:

- It is recommended that the system be initially charged with about 75% by weight of the original charge.
  - Add the initial charge of Suva® refrigerant to the high-pressure side of the system (compressor *not* running) until the system and cylinder pressures equalize. Then connect to the low-pressure side of the system, start the compressor, and load the remainder of the refrigerant slowly to the suction side of the system. You should be removing liquid from the charging cylinder, and therefore should charge slowly to allow the refrigerant to flash (vaporize) before entering the compressor suction and avoid compressor damage.
9. **Start up system, adjust charge size. Label system for the refrigerant and lubricant used.** Start the system and let conditions stabilize. If the system is undercharged, add Suva® 404A (HP62) or Suva® 507 in small amounts (still removing liquid from the charging cylinder) until the system conditions reach the desired level. See the Pressure/Temperature Charts in this bulletin to compare pressures and temperatures for the Suva® refrigerant you are using.

Suva® refrigerants are more sensitive to charge size than CFCs. System performance will change quickly if the system is overcharged or undercharged. Sight glasses in the liquid line can be used in most cases as a guide, but system charge should also be determined by measuring system operating conditions (discharge and suction pressures, suction line temperature, compressor motor amps, superheat, etc.). **Attempting to charge until the sight glass is clear may result in overcharging the refrigerant.** Please read “How to Determine Suction Pressure, Superheat, and Subcool” on page 8.

### Retrofit of R-22 Systems to DuPont™ Suva® 404A (HP62) or DuPont™ Suva® 507

The following detailed discussion is the recommended procedure for retrofitting R-22 systems to Suva® 404A (HP62) or Suva® 507.

1. **Establish baseline performance with R-22.** Collect system performance data while the R-22 is in the system. Check for correct refrigerant charge and operating conditions. The baseline data of temperatures and pressures at various points in the system (evaporator, condenser, compressor suction and discharge, superheat



and subcool, etc.) at normal operating conditions will be useful when optimizing operation of the system with the Suva® refrigerant. A **System Data Sheet** is included at the back of this document to record baseline data.

2. **Drain mineral oil or alkylbenzene from the system and measure the volume removed. Leave the R-22 in the system.** If mineral oil or alkylbenzene is the existing lubricant, it will have to be drained. This may require removing the compressor from the system, particularly with small hermetic compressors that have no oil drain port. In this case, the lubricant should be drained from the suction port on the compressor after the R-22 has been properly recovered. For an effective flush, it is important to remove at least 50% of the lubricant in all cases. Larger systems may require drainage from additional points in the system, particularly low spots around the evaporator. In systems with an oil separator, any lubricant present in the separator should also be drained.

In all cases, measure the volume of lubricant removed from the system. Record this information on the Retrofit Checklist (see Appendix). Compare this volume with the compressor/system specifications to ensure that the majority of lubricant has been removed. Consult the compressor manufacturer for recommendations on allowable residual MO/AB in POE lubricant. If poor system performance is noted on start-up, an additional lubricant change may be required.

3. **Add POE lubricant; use the same volume as removed in Step 2. Start up system and operate for at least 24 hours, or more if system has complex piping.** Charge the compressor with the same volume of new lubricant as the amount you removed from the system in step 2. Use a lubricant viscosity and grade recommended by the compressor manufacturer for the Suva® refrigerant you are using; or use a similar viscosity to the MO/AB you removed if compressor information is not available. A typical viscosity is 150 SUS or ISO 32 for many compressors.
4. **Drain POE, and repeat steps 2 and 3 at least two more times. Continue flushing until MO/AB is less than 5% by weight or as recommended by compressor manufacturer.** For an HFC refrigerant to operate properly in a retrofitted system, the residual MO/AB concentration must be very low. Repeatedly removing and replacing the POE

will flush the old oil from the refrigeration system, providing that enough time is allowed with each change to circulate oil through the entire system.

5. **Recover the R-22 charge into a proper recovery cylinder.** Use normal service practices. If the correct charge size is not known, weigh the amount of refrigerant recovered.
6. **Replace the filter/drier.** It is routine practice to replace the filter/drier following system maintenance. Replacement driers are available that are compatible with Suva® refrigerants. See page 2 of this manual for additional information on driers.
7. **Evacuate system and check for leaks.** To remove air or other noncondensables in the system, evacuate the system to near full vacuum (29.9 inHg vacuum [500 microns] or less than 10 kPa).
8. **Charge with Suva® refrigerant. Remove liquid only from charging cylinder.** *The proper cylinder position for liquid removal is indicated by arrows on the cylinder and cylinder box.* Once liquid is removed from the cylinder, the refrigerant can be charged to the system as liquid or vapor as desired. Use the manifold gauges or a throttling valve to flash the liquid to vapor if required.

In general, the refrigeration system will require less weight of the Suva® refrigerant than of R-22. The optimum charge will vary depending on the system design and operating conditions, but for most systems the best charge size will be 75–90% by weight of the original charge.

For best results:

- It is recommended that the system be initially charged with about 75% by weight of the original charge.
- Add the initial charge of Suva® refrigerant to the high-pressure side of the system (compressor *not* running) until the system and cylinder pressures equalize. Then connect to the low-pressure side of the system, start the compressor, and load the remainder of the refrigerant slowly to the suction side of the system. You should be removing liquid from the charging cylinder, and therefore should charge slowly to allow the refrigerant to flash (vaporize) before entering the compressor suction and avoid compressor damage.

9. **Start up system, adjust charge size. Label system for the refrigerant and lubricant used.** Start the system and let conditions stabilize. If the system is undercharged, add Suva® 404A (HP62) or Suva® 507 in small amounts (still removing liquid from the charging cylinder) until the system conditions reach the desired level. See the Pressure/Temperature Charts in this bulletin to compare pressures and temperatures for the Suva® refrigerant you are using.

Suva® refrigerants are more sensitive to charge size than R-22. System performance will change quickly if the system is overcharged or undercharged. Sight glasses in the liquid line can be used in most cases as a guide, but system charge should also be determined by measuring system operating conditions (discharge and suction pressures, suction line temperature, compressor motor amps, superheat, etc.). **Attempting to charge until the sight glass is clear may result in overcharging the refrigerant.** Please read “How to Determine Suction Pressure, Superheat, and Subcool” below.

**“Helpful Hints” For Retrofit From R-22 To Suva® 404A (HP62) or 507**

Both Suva® 404A (HP62) and 507 have minimal “temperature glide” and can be used in systems that have flooded evaporators and condensers, as well as those that have direct expansion evaporators.

Since 404A (HP62) and 507 have higher cooling capacity than R-22, at lower evaporator temperatures the expansion device may need to be adjusted or replaced to maintain proper flow control and superheat settings. Estimated capacity comparison:

Evaporator Temperature	Capacity
30 to 50°F (-1 to 10°C)	Same
0°F (-18°C)	+6%
-40°F (-40°C)	+30%

Verify that compressor suction and discharge piping is the proper size to maintain proper refrigerant velocity and pressure drop.

Compressor discharge temperature will be lower than R-22.

The compressor discharge pressure will be higher with 404A (HP62) and 507. Various pressure switches may need to be adjusted to maintain proper operating conditions; for example:

- Evaporator pressure regulators
- Cut-in and cut-out pressure switches
- Condenser fan cycling pressure switches

- Head pressure controls
- Crankcase pressure regulators
- Others

Due to the higher oil miscibility with HFCs and POE, verify proper compressor oil sump levels.

Check with the compressor manufacturer for proper amperage load ratings.

**Pressure/Temperature Charts – Introduction**

**How to Read the Pressure/Temperature Charts**

Tables 1 through 5 contain pressure/temperature charts for the refrigerants discussed in this bulletin.

R-12, R-22 and Suva® 134a are all single component refrigerants with no temperature “glide” in the evaporator or condenser. Suva® 404A (HP62) and 507 have very small glide (less than 1°F [0.6°C]). For field service purposes, this glide can be neglected in calculating superheat and subcool. The evaporator temperature can be considered equal to the saturated vapor temperature at the compressor suction pressure; the condenser temperature can be considered equal to the saturated vapor temperature or the saturated liquid temperature at the compressor discharge pressure. For Suva® 404A (HP62) and 507, the saturated vapor temperatures are listed in the tables.

**How to Determine Suction Pressure, Superheat, and Subcool**

**Suction Pressure**

Determine the expected evaporator temperature using the R-12, R-502 or R-22 column (from the baseline data you collected prior to the retrofit). Find the same expected evaporator temperature in the column for Suva® 134a, 404A (HP62) or 507. Note the corresponding pressure for this temperature. This is the suction pressure at which the system should operate.

**Superheat and Subcool**

Using the temperature column for Suva® 134a, 404A (HP62) and 507, the amount of superheat and subcool is calculated in the same manner as for the CFC or HCFC refrigerant.

**Note:** The amount of vapor superheat is always calculated from the actual saturated vapor temperature; the amount of liquid subcool is always calculated from the actual saturated liquid temperature.

Retrofit Checklist for  
DuPont™ Suva® 134a, DuPont™ Suva® 404A (HP62), or DuPont™ Suva® 507

- \_\_\_\_\_ 1. Establish baseline performance with R-12, R-502, or R-22. (See data sheet for recommended data.)
- \_\_\_\_\_ 2. Consult the original equipment manufacturer of the system components for recommendations on the following:
  - Plastics compatibility
  - Elastomers compatibility
  - Lubricant (viscosity, manufacturer)
  - Retrofit procedure to sustain warranty
- \_\_\_\_\_ 3. Drain lubricant charge from the refrigerant system (unless polyol ester lubricant is already in the system).
  - Remove majority of lubricant from system.
  - Measure amount of lubricant removed and record: \_\_\_\_\_.
- \_\_\_\_\_ 4. Charge polyol ester lubricant using amount equivalent to amount of mineral oil removed. Run system with R-12, R-502, or R-22 for 24 hours, minimum.
- \_\_\_\_\_ 5. Repeat lubricant drain and POE charging two more times or until mineral oil content is less than 5%.
- \_\_\_\_\_ 6. Remove R-12, R-502, or R-22 charge from system. (Need 10–20 inHg vacuum [34–67 kPa].)
- \_\_\_\_\_ 7. Replace filter drier with new drier approved for use with Suva® 134a, Suva® 404A (HP62), or Suva® 507.
- \_\_\_\_\_ 8. Reconnect system and evacuate with vacuum pump. (Evacuate to full vacuum [29.9 inHg vacuum/0.14 kPa].)
- \_\_\_\_\_ 9. Leak-check system. (Reevacuate system following leak check.)
- \_\_\_\_\_ 10. Charge system with Suva®.
  - Initially charge 75% by weight of original equipment manufacturer R-12, R-502, or R-22 charge.
  - Amount of refrigerant charged: \_\_\_\_\_.
- \_\_\_\_\_ 11. Start equipment and adjust charge until desired operating conditions are achieved. If low in charge, add in increments of 2–3% of original R-12, R-502, or R-22 charge.
  - Amount of refrigerant charged: \_\_\_\_\_.
  - *Total refrigerant charged:* \_\_\_\_\_.
- \_\_\_\_\_ 12. Label components and system for type of refrigerant (Suva® 134a, Suva® 404A (HP62), or Suva® 507) and lubricant (polyol ester).

*Retrofit is complete.*

# System Data Sheet

Type of System/Location: \_\_\_\_\_

Equipment Mfg.: _____	Compressor Mfg.: _____
Model No.: _____	Model No.: _____
Serial No.: _____	Serial No.: _____
Original Charge Size: _____	Original Lubricant: _____

Type/Mfg: \_\_\_\_\_

Lubricant Charge Size: \_\_\_\_\_

New Lubricant: \_\_\_\_\_

Type/Mfg: \_\_\_\_\_

1st Charge Size: \_\_\_\_\_

2nd Charge Size: \_\_\_\_\_

Additional Charge Size: \_\_\_\_\_

Drier Type (check one):

Loose Fill: \_\_\_\_\_

Solid Core: \_\_\_\_\_

Drier Mfg.: \_\_\_\_\_

Model No.: \_\_\_\_\_

\_\_\_\_\_

Condenser Cooling Medium (air/water): \_\_\_\_\_

Expansion Device (check one):                      Capillary Tube: \_\_\_\_\_

Expansion Valve: \_\_\_\_\_

If Expansion Valve:

Manufacturer: \_\_\_\_\_

Model No.: \_\_\_\_\_

Control/Set Point: \_\_\_\_\_

Location of Sensor: \_\_\_\_\_

Other System Controls (ex.: head press control), Describe: \_\_\_\_\_

\_\_\_\_\_

(circle units used where applicable)

Date/Time				
Refrigerant				
Charge Size (lb, oz/g)				
Ambient Temp. (°F/°C)				
Relative Humidity				
Compressor:				
Suction T (°F/°C)				
Suction P (psi/kPa/bar)				
Discharge T (°F/°C)				
Discharge P (psi/kPa/bar)				
Box/Case T (°F/°C)				
Evaporator:				
Refrigerant Inlet T (°F/°C)				
Refrigerant Outlet T (°F/°C)				
Coil Air/H <sub>2</sub> O In T (°F/°C)				
Coil Air/H <sub>2</sub> O Out T (°F/°C)				
Refrigerant T at Superheat Ctl. Pt. (°F/°C)				
Condenser:				
Refrigerant Inlet T (°F/°C)				
Refrigerant Outlet T (°F/°C)				
Coil Air/H <sub>2</sub> O In T (°F/°C)				
Coil Air/H <sub>2</sub> O Out T (°F/°C)				
Exp. Device Inlet T (°F/°C)				
Motor Amps				
Run/Cycle Time				
Comments: _____				
_____				

## Appendix

**Table 1**  
**Pressure/Temperature Chart**  
**DuPont™ Suva® 134a/R-12 Saturation Properties**

English Units			SI Units		
Pressure, psi	R-12 Saturation Temperature, °F	HFC-134a Saturation Temperature, °F	Pressure, kPa	R-12 Saturation Temperature, °C	HFC-134a Saturation Temperature, °C
15*	-49	-40	25	-59	-53
10*	-38	-30	50	-45	-40
5*	-29	-22	75	-37	-32
0	-22	-15	100	-30	-26
5	-9	-3	125	-24	-21
10	2	7	150	-20	-17
15	10	15	175	-16	-13
20	18	22	200	-12	-10
25	26	29	225	-9	-7
30	32	35	250	-6	-4
35	38	40	275	-4	-2
40	43	45	300	-1	1
45	48	50	325	2	3
50	53	54	350	4	5
55	58	58	375	6	7
60	62	62	400	8	9
65	66	66	450	12	12
70	70	69	500	16	16
75	74	73	550	19	19
80	77	76	600	22	22
85	81	79	650	25	24
90	84	82	700	28	27
95	87	85	750	30	29
100	90	88	800	33	31
110	96	93	900	37	36
120	102	98	1000	42	39
130	107	103	1200	49	46
140	112	107	1400	56	52
150	117	112	1600	62	58
165	123	118	1800	68	63
180	130	123	2000	73	67
195	136	129	2200	78	72
210	141	134	2400	82	76
225	147	139	2600	86	79
240	152	143	2800	90	83
255	157	148	3000	94	86
270	162	152	3200	98	89
285	166	156	3400	101	93
300	170	160	3600	104	95

\*inHg, vacuum

**Table 2**  
**Pressure/Temperature Chart**  
**DuPont™ Suva® 404A (HP62)/R-502 Saturation Properties**

**English Units**

Pressure, psi	R-502 404A (HP62)		Pressure psi	R-502 404A (HP62)	
	Sat. Temp, °F	Sat. Temp, °F		Sat. Temp, °F	Sat. Temp, °F
25*	-108	-107	58	24	22
20*	-88	-87	60	26	23
15*	-75	-75	62	27	25
10*	-65	-65	64	29	26
5*	-56	-57	66	30	28
4*	-55	-56	68	32	29
3*	-54	-54	70	33	30
2*	-53	-53	72	34	32
1*	-52	-52	74	36	33
0	-50	-50	76	37	34
2	-45	-45	78	38	35
4	-40	-41	80	40	36
6	-36	-37	82	41	37
8	-32	-33	84	42	38
10	-29	-30	86	43	40
12	-25	-26	88	45	41
14	-22	-23	90	46	43
16	-19	-20	92	47	44
18	-16	-18	94	48	45
20	-13	-15	96	49	46
22	-11	-12	98	50	47
24	-8	-10	100	51	48
26	-6	-7	105	54	51
28	-3	-5	110	57	53
30	-1	-3	115	60	56
32	1	-1	120	62	58
34	3	2	125	64	60
36	5	3	130	67	63
38	7	5	135	69	65
40	9	7	140	71	67
42	11	9	145	73	69
44	13	11	150	75	71
46	15	12	175	85	81
48	16	14	200	95	89
50	18	16	250	111	104
52	20	17	300	125	118
54	21	19	350	137	129
56	23	20	400	148	140

**SI Units**

Pressure, kPa	R-502 404A (HP62)		Pressure kPa	R-502 404A (HP62)	
	Sat. Temp, °C	Sat. Temp, °C		Sat. Temp, °C	Sat. Temp, °C
25	-72	-71	1450	34	31
50	-60	-59	1500	35	32
75	-52	-52	1550	37	34
100	-46	-46	1600	38	35
125	-41	-41	1650	39	36
150	-37	-37	1700	41	37
175	-33	-34	1750	42	38
200	-30	-30	1800	43	40
225	-27	-28	1900	46	42
250	-24	-25	2000	48	44
275	-22	-22	2100	50	46
300	-19	-20	2200	52	48
325	-17	-18	2300	54	50
350	-15	-16	2400	56	52
375	-13	-14	2500	58	54
400	-11	-12	2600	60	56
425	-9	-10	2700	62	57
450	-8	-9	2800	64	59
475	-6	-7	2900	65	61
500	-4	-6			
550	-1	-3			
600	2	0			
650	4	2			
700	7	5			
750	9	7			
800	11	9			
850	13	11			
900	15	13			
950	17	15			
1000	19	17			
1050	21	19			
1100	23	20			
1150	25	22			
1200	26	24			
1250	28	25			
1300	29	27			
1350	31	28			
1400	32	30			

\*inHg, vacuum

**Table 3**  
**Pressure/Temperature Chart**  
**DuPont™ Suva® 507/R-502 Saturation Properties**

English Units						SI Units					
Pressure, psi	R-502 Sat. Temp, °F	507 Sat. Temp, °F	Pressure, psi	R-502 Sat. Temp, °F	507 Sat. Temp, °F	Pressure, kPa	R-502 Sat. Temp, °C	507 Sat. Temp, °C	Pressure, kPa	R-502 Sat. Temp, °C	507 Sat. Temp, °C
25*	-108	-110	58	24	19	25	-72	-72	1000	19	16
20*	-88	-90	60	26	21	50	-60	-61	1050	21	17
15*	-75	-77	62	27	22	75	-52	-53	1100	23	19
10*	-65	-67	64	29	24	100	-46	-47	1150	25	21
5*	-56	-61	66	30	25	125	-41	-43	1200	26	22
4*	-55	-59	68	32	26	150	-37	-39	1250	28	24
3*	-54	-58	70	33	28	175	-33	-35	1300	29	25
2*	-53	-57	72	34	29	200	-30	-32	1350	31	27
1*	-52	-56	74	36	30	225	-27	-29	1400	32	28
0	-50	-54	76	37	32	250	-24	-26	1450	34	30
2	-45	-48	78	38	33	275	-22	-24	1500	35	31
4	-40	-44	80	40	34	300	-19	-22	1550	37	32
6	-36	-39	82	41	35	325	-17	-19	1600	38	34
8	-32	-36	84	42	37	350	-15	-17	1650	39	35
10	-29	-32	86	43	38	375	-13	-15	1700	41	36
12	-25	-29	88	45	39	400	-11	-14	1750	42	37
14	-22	-26	90	46	40	425	-9	-12	1800	43	38
16	-19	-23	92	47	41	450	-8	-10	1900	46	41
18	-16	-20	94	48	42	475	-6	-9	2000	48	43
20	-13	-17	96	49	43	500	-4	-7	2100	50	45
22	-11	-15	98	50	44	550	-1	-4	2200	52	47
24	-8	-12	100	51	46	600	2	-2	2300	54	49
26	-6	-10	105	54	48	650	4	1	2400	56	51
28	-3	-8	110	57	51	700	7	4	2500	58	53
30	-1	-6	115	60	53	750	9	6	2600	60	54
32	1	-3	120	62	55	800	11	8	2700	62	56
34	3	-1	125	64	58	850	13	10	2800	64	58
36	5	1	130	67	60	900	15	12	2900	65	59
38	7	3	135	69	62	950	17	14			
40	9	4	140	71	64						
42	11	6	145	73	66						
44	13	8	150	75	69						
46	15	10	175	85	78						
48	16	11	200	95	87						
50	18	13	250	111	102						
52	20	15	300	125	115						
54	21	16	350	137	127						
56	23	18	400	148	137						

\*inHg, vacuum

**Table 4**  
**Pressure/Temperature Chart**  
**DuPont™ Suva® 404A (HP62)/R-22 Saturation Properties**

English Units						SI Units					
Pressure, psi	R-22 Sat. Temp, °F	404A (HP62) Sat. Temp, °F	Pressure psi	R-22 Sat. Temp, °F	404A (HP62) Sat. Temp, °F	Pressure, kPa	R-22 Sat. Temp, °C	404A (HP62) Sat. Temp, °C	Pressure kPa	R-22 Sat. Temp, °C	404A (HP62) Sat. Temp, °C
25*	-100	-107	58	32	22	25	-67	-71	1450	38	31
20*	-80	-87	60	34	23	50	-55	-59	1500	39	32
15*	-66	-75	62	35	25	75	-47	-52	1550	40	34
10*	-56	-65	64	37	26	100	-41	-46	1600	42	35
5*	-48	-57	66	38	28	125	-36	-41	1650	43	36
4*	-47	-56	68	40	29	150	-32	-37	1700	44	37
3*	-45	-54	70	41	30	175	-28	-34	1750	46	38
2*	-44	-53	72	42	32	200	-25	-30	1800	47	40
1*	-43	-52	74	44	33	225	-22	-28	1900	49	42
0	-41	-50	76	45	34	250	-20	-25	2000	51	44
2	-36	-45	78	46	35	275	-17	-22	2100	53	46
4	-32	-41	80	48	36	300	-15	-20	2200	56	48
6	-28	-37	82	49	37	325	-12	-18	2300	58	50
8	-24	-33	84	50	38	350	-10	-16	2400	59	52
10	-20	-30	86	51	40	375	-8	-14	2500	61	54
12	-17	-26	88	52	41	400	-7	-12	2600	63	56
14	-14	-23	90	54	43	425	-5	-10	2700	65	57
16	-11	-20	92	55	44	450	-3	-9	2800	67	59
18	-8	-18	94	56	45	475	-1	-7	2900	68	61
20	-5	-15	96	57	46	500	0	-6			
22	-2	-12	98	58	47	550	3	-3			
24	0	-10	100	59	48	600	6	0			
26	2	-7	105	62	51	650	8	2			
28	5	-5	110	64	53	700	11	5			
30	7	-3	120	69	58	750	13	7			
32	9	-1	125	72	60	800	15	9			
34	11	2	130	74	63	850	18	11			
36	13	3	135	76	65	900	20	13			
38	15	5	140	78	67	950	22	15			
40	17	7	145	81	69	1000	23	17			
42	19	9	150	83	71	1050	25	19			
44	21	11	175	93	81	1100	27	20			
46	23	12	200	101	89	1150	29	22			
48	24	14	250	117	104	1200	30	24			
50	26	16	300	131	118	1250	32	25			
52	28	17	350	143	129	1300	33	27			
54	29	19	400	154	140	1350	35	28			
56	31	20				1400	36	30			

\*inHg, vacuum



**Table 5**  
**Pressure/Temperature Chart**  
**DuPont™ Suva® 507/R-22 Saturation Properties**

English Units						SI Units					
Pressure, psi	R-22 Sat. Temp, °F	507 Sat. Temp, °F	Pressure psi	R-22 Sat. Temp, °F	507 Sat. Temp, °F	Pressure, kPa	R-22 Sat. Temp, °C	507 Sat. Temp, °C	Pressure kPa	R-22 Sat. Temp, °C	507 Sat. Temp, °C
25*	-100	-110	58	32	19	25	-67	-72	1000	23	16
20*	-80	-90	60	34	21	50	-55	-61	1050	25	17
15*	-66	-77	62	35	22	75	-47	-53	1100	27	19
10*	-56	-67	64	37	24	100	-41	-47	1150	29	21
5*	-48	-61	66	38	25	125	-36	-43	1200	30	22
4*	-47	-59	68	40	26	150	-32	-39	1250	32	24
3*	-45	-58	70	41	28	175	-28	-35	1300	33	25
2*	-44	-57	72	42	29	200	-25	-32	1350	35	27
1*	-43	-56	74	44	30	225	-22	-29	1400	36	28
0	-41	-54	76	45	32	250	-20	-26	1450	38	30
2	-36	-48	78	46	33	275	-17	-24	1500	39	31
4	-32	-44	80	48	34	300	-15	-22	1550	40	32
6	-28	-39	82	49	35	325	-12	-19	1600	42	34
8	-24	-36	84	50	37	350	-10	-17	1650	43	35
10	-20	-32	86	51	38	375	-8	-15	1700	44	36
12	-17	-29	88	52	39	400	-7	-14	1750	46	37
14	-14	-26	90	54	40	425	-5	-12	1800	47	38
16	-11	-23	92	55	41	450	-3	-10	1900	49	41
18	-8	-20	94	56	42	475	-1	-9	2000	51	43
20	-5	-17	96	57	43	500	0	-7	2100	53	45
22	-2	-15	98	58	44	550	3	-4	2200	56	47
24	0	-12	100	59	46	600	6	-2	2300	58	49
26	2	-10	105	62	48	650	8	1	2400	59	51
28	5	-8	110	64	51	700	11	4	2500	61	53
30	7	-6	120	69	55	750	13	6	2600	63	54
32	9	-3	125	72	58	800	15	8	2700	65	56
34	11	-1	130	74	60	850	18	10	2800	67	58
36	13	1	135	76	62	900	20	12	2900	68	59
38	15	3	140	78	64	950	22	14			
40	17	4	145	81	66						
42	19	6	150	83	69						
44	21	8	175	93	78						
46	23	10	200	101	87						
48	24	11	250	117	102						
50	26	13	300	131	115						
52	28	15	350	143	127						
54	29	16	400	154	137						
56	31	18									

\*inHg, vacuum

**Table 6**  
**DuPont™ Suva® 134a (R-134a) Physical Properties**

Physical Property	Unit	DuPont™ Suva® 134a (R-134a)	R-12
Boiling Point at 1 atm	°F	-14.9	-21.6
	°C	-26.1	-29.8
Vapor Pressure Sat'd Liquid at 77°F (25°C)	psia	96.61	94.51
	kPa	666.1	651.6
Liquid Density at 77°F (25°C)	lb/ft <sup>3</sup>	75.28	81.84
	kg/m <sup>3</sup>	1,206	1,311
Density Sat'd Vapor at 77°F (25°C)	lb/ft <sup>3</sup>	2.02	2.32
	kg/m <sup>3</sup>	32.4	37.2
Ozone-Depletion Potential Compared with CFC-12	CFC-12 = 1	0	1
Global Warming Potential Compared with CO <sub>2</sub>	CO <sub>2</sub> = 1	1300	8500

**Table 7**  
**DuPont™ Suva® 404A (HP62) and DuPont™ Suva® 507 (R-507) Physical Properties**

Physical Property	Unit	DuPont™ Suva® 404A (HP62)	DuPont™ Suva® 507 (R-507)	R-502	R-22
Boiling Point at 1 atm	°F	-51.6	-52.1	-49.8	-41.4
	°C	-46.5	-46.7	-45.4	-40.8
Vapor Pressure Sat'd Liquid at 77°F (25°C)	psia	182	187	168	151
	kPa	1,255	1,287	1,162	1,041
Liquid Density at 77°F (25°C)	lb/ft <sup>3</sup>	65.45	65.5	75.9	74.5
	kg/m <sup>3</sup>	1,048	1,049	1,217	1193
Density Sat'd Vapor at 77°F (25°C)	lb/ft <sup>3</sup>	4.0	4.3	4.2	2.8
	kg/m <sup>3</sup>	64.1	68.9	67.3	44.9
Ozone-Depletion Potential Compared with R-12	R-12 = 1	0	0	0.23	0.05
Global Warming Potential Compared with CO <sub>2</sub>	CO <sub>2</sub> = 1	3260	3300	5494	1700

**Table 8**  
**Compositions of DuPont™ Suva® Refrigerants**

Compositions, wt%	HFC-125	HFC-143a	HFC-134a
Suva® 404A (HP62)	44	52	4
Suva® 507 (R-507)	50	50	
Suva® 134a (R-134a)			100



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## For Further Information:

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